II. WATER DEMAND AND SUPPLY

2.1 Water Allocation and Use

The constitution and statutes of the State of Idaho declare all waters to be property of the state. This includes streams and rivers flowing in natural channels, springs and lakes, and all ground water. A water right represents permission from the state to put its waters to a beneficial use. A water rights describe the source of water, priority date, the amount of water to be used, what the water is to be used for, and where and when the water will be used. IDWR administers water rights in Idaho based upon the Doctrine of Prior Appropriation, (i.e., first in time is first in right.)

Water use in the South Fork Clearwater River basin is mostly consumptive, although consumptive water use is low relative to the total amount of available water. As displayed in Fig. 6, water claims for commercial and industrial uses comprise the largest potential water use in the basin. Appropriations for commercial and industrial uses are about 95% from ground water. Surface and spring water use is about one third the amount of the ground water use in the basin. The number of claims for spring, surface water, and ground water permits are each about 100.

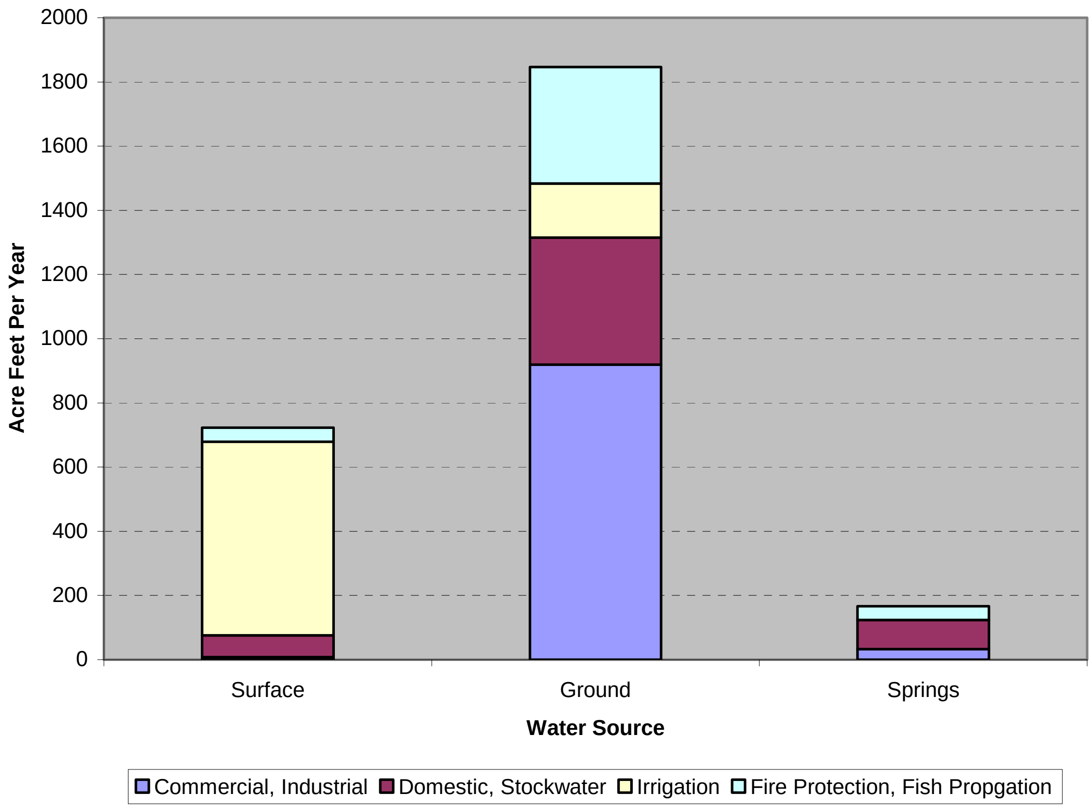


Fig. 1. Water use and source.

2.2 Water Demand

Irrigation development in the basin constitutes about 25% of total potential water use based on water rights and claims. As shown in Figs. 2 and 3, irrigation is the greatest potential use of surface water and the smallest use of ground water. Pasture for cattle and horse forage is the primary use for surface irrigation. There is some, though relatively little, crop irrigation primarily on the Camas Prairie. Basin irrigation relies primarily on surface water.

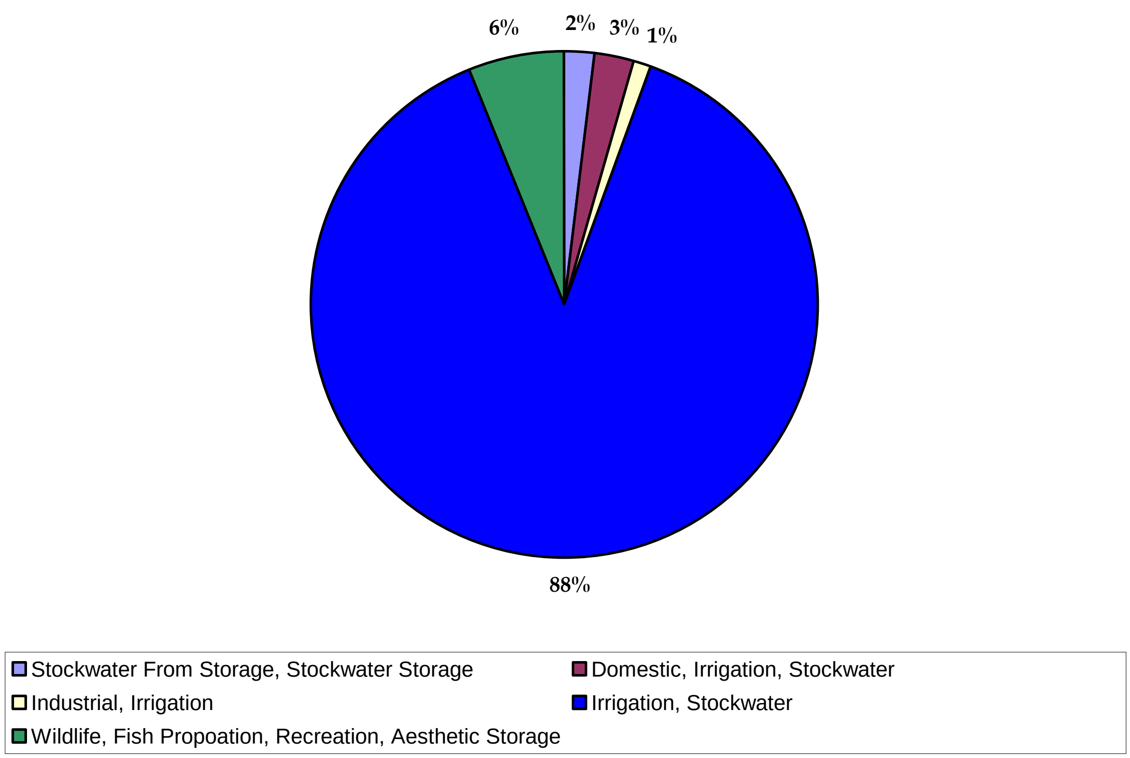


Fig. 2. Surface water use permits and rights.

The largest component of the water used in the basin, 68%, is from ground water, and it is relied upon heavily for domestic and municipal supplies (see Fig. 6 where domestic includes municipal use in the graph). Ground water supplies approximately 40% of domestic, commercial, and municipal users in the basin. Surface water supplies about 26% of the water used in the basin, and the remaining water supply comes from springs. Because this information is based upon water rights it is important to note that there are domestic wells in use that do not have a water right. It is not always necessary, though it is highly recommended, to have a water right for a domestic well. Therefore, the domestic water use is higher than the water right information provides. Approximately 2,750 people in the basin get their domestic water from municipal systems, which is slightly over half the population in the basin (Progressive Engineering Group, Inc., Kimball Engineering, Entranco).

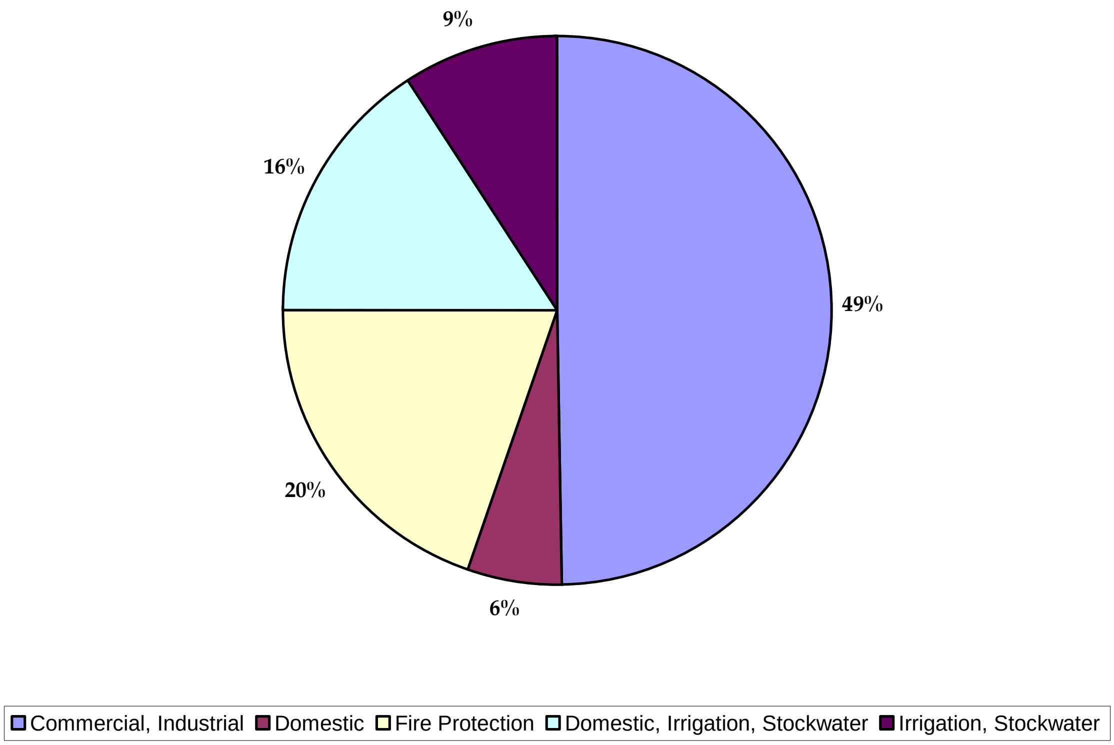


Fig. 3. Ground water rights and permits.

2.2.1 Agriculture Demand

Data for this section were obtained from the National Agricultural Service. The data are available for Idaho County only. The latest year for which data were available is 1997. For a more local perspective of the basin, qualitative information was obtained from local agencies.

Total land in farms is 649,851 acres. Most of these farms are larger than 200 acres and more than a third are larger than 2,000 acres. Farm size has been relatively stable over the last decade of data (from 1987 to 1997). The major crops in the area are wheat, (62,283 acres); hay/alfalfa, (41,025 acres) and barley (28,972 acres). Pastureland accounts for 429,546 acres. Wheat is by far the biggest cash crop in the county followed by barley (see Table 14). Few other crops are grown. Livestock, including poultry, also play an important part in the economy of the county.

Agricultural Irrigation Demand

In Idaho County, there are more than 2,000 irrigated acres, 1,200 of which are irrigated cropland, most of the rest is irrigated pastureland. Most of these acres are located along the Salmon River. Total irrigated acres in 1997 represent an almost 100% decline in irrigated acres from 1987.

Present agricultural irrigation in the South Fork Clearwater basin is less than 100 acres. It includes 30 acres of corn and 20 acres of pasture on Camas Prairie (B. Sandalin, NRCS, 8/5/03). The pasture is irrigated occasionally and the corn is irrigated each year from wells. In addition, a few small (5 acre) tracts are irrigated along the lower South Fork Clearwater River. These tracts use water from the river or tributary streams. The Camas Prairie and the valley bottoms receive approximately 22 inches of precipitation each year, which is more than adequate for the crops grown. The crop yield is limited by temperature and growing season, rather than by the lack of moisture. Yields of 110 bushels per acre are common for wheat and barley in this area. Although irrigation would increase crop yields during drought and occasional dry periods during the growing season, investment in irrigation systems is not economically viable. Development of ground water and surface water irrigation systems would be expensive and would not increase yield sufficiently to justify the investment.

Approximately 800 acres of potentially irrigable agricultural land were found in the South Fork Clearwater River basin based upon analysis by IDWR. This analysis used geographic information system data. Private land not currently irrigated with slight to moderate limitations (class 1 and 2, U.S. Department of Agriculture 1995) for irrigation based upon slope, surface texture, soil drainage, water table depth, and other soil characteristics was selected. Possible water sources for the potential irrigation include springs, surface water and ground water. Private lands were selected because it is unlikely that public lands would be irrigated. Nearly all of the potentially irrigable lands were on the Camas Prairie and some land near the South Fork Clearwater River north of Harpster.

The lack of a sizable local market and infrastructure for food processing suggests that high-valued crops, some of which use more water than current crops are unlikely to be grown in the basin in the foreseeable future. The stability of the existing farms in terms of acreage and crops suggests that major change is unlikely. The reduction in irrigated acreage in the county suggests a trend toward less irrigation. In conclusion, there appears to be no evidence for large future agricultural irrigation demand either on the Camas Prairie or in the river bottoms.

Livestock Watering

Domestic sheep and cattle arrived in the basin in the mid 1860s, with the gold rush and the influx of non-natives (IDEQ 2002). It is estimated that more grazing by domestic livestock occurred in the early 1900s than occurs now (IDEQ 2002). The Nez Perce also pastured horses throughout the area including the South Fork Clearwater River drainage.

By 1908, when the Nez Perce NF was established and grazing laws were enacted, combination farm and ranch homesteads on the prairie were common. Stites, a community along the South Fork Clearwater River, was the major livestock shipping area for the entire county.

Standard water use, as defined by IDWR, is 12 gallons of water per day for range cattle and horses, and two gallons per day for sheep. Total stock water use was estimated by multiplying the number of gallons typically used in a day by an estimate of days of livestock water use. Total annual livestock water use in the basin is estimated at 11.3 AF, based on an estimated 308,010 days of grazing by livestock in the basin per year. Until recently, Idaho water law did not allow diversion of stock water from live streams to watering troughs unless the landowner held a permitted water right. This law was a disincentive for livestock owners who wanted to develop off-stream water facilities for water quality and stream protection purposes. Idaho Code now allows diversion of in-stream stock water to troughs without the previously required water right (*Idaho Code § 42-113*). The code also covers other requirements related to off-stream livestock water facilities.

Most of the water provided for livestock consumption in the South Fork Clearwater River is surface water. Information on current grazing distribution is limited to allotments on public lands within the basin. The number of livestock in federal management areas is an estimate based on the number of grazing permits issued and Animal Unit Months (AUM's). One AUM is equal to: one bull, steer, or cow with suckling calf, one horse/ mule, or five sheep/goats grazing for one month. Cattle are the only livestock permitted on USFS lands in the South Fork Clearwater River drainage (USFS 1998). Currently, there are 10 active cattle allotments with a total of 9,657 cattle AUM's in the South Fork Clearwater River basin of the Nez Perce NF (Lake, 2002). The BLM has 21 allotments on its land with a total of 243 AUM's. Idaho Department of Lands has nine cattle allotment with a total of 367 AUM's. Most of the cattle that graze on public lands only do so part of the year. The upper basin within the national forest receives heavy snows starting in late October or November. Cattle are removed from these areas and shipped to market or other suitable grazing areas, typically out of the basin.

There is no information on the number of livestock grazing on private lands on the Camas Prairie portion of the South Fork Clearwater River Basin (Hohle 2002).

2.2.2 DCMI Water Use

In general, demand for domestic, commercial, municipal, and industrial (DCMI) water depends on the size and characteristics of the population including their preferences for low-density housing and water intensive activities, the price of water, weather conditions and the characteristics of the commercial and industrial sectors of the local economy. Future demand therefore depends on the same set of factors. Because the total population is predicted to be stable over the next 25 years, demand factors are unlikely to change substantially. The local non-agricultural economy is likely to continue to change from one based on manufacturing to one based on services (Fig. 13), however, because water use for the service sector is relatively low, in general, and manufacturing relatively high (Cook 2001), future water use is more likely to decrease than increase.

Information on current local water use was available from three sources: The Water System Study for the City of Cottonwood (Kimball Engineering), the Water System Engineering Study for the City of Grangeville (Entranco), Evaluation of Ground Water Resources in the Vicinity of Grangeville, Idaho (Ralston, D., K. Sprenke, w. Dansart and W. Rember. 1993) and the Water Study for the City of Kooskia (Progressive Engineering). Estimates of water use for these municipal systems underestimate total water use because the use of private wells in rural and some urban areas. However, it is possible to use the measurements of gallons per person per day from the studies to extrapolate to use outside municipal boundaries after making adjustments for commercial water use included in the measurements. Some underestimation may remain because of the use of both a municipal system for drinking water and a well for irrigation (dual use). This doesn't appear to be a major consideration in either Cottonwood or Grangeville because of the relatively high measured water use per customer. Use ranges from 430 gallons per persons per day (GPD) to 460 GPD. Kooskia may have more dual users, as per customer use appears to be relatively low at 305 GPD.

Table 1. Estimates of annual DCMI water use in thousands of gallons.

Kooskia	Grangeville	Cottonwood	Other	Total
74,382	240,887	78,414	1,222,452	1,616,135

2.2.3 Nonconsumptive demands

Idaho Code directs the IWRB to evaluate the waterways of the state for “outstanding” fish and wildlife, recreational, aesthetic, and geological values. Outstanding resources are indicated by: 1) unique or rare features of regional or national importance, 2) significant public concern for protection and/or, 3) existing legal protection or special agency management designation to protect important resource values or the public safety.

The South Fork Clearwater River basin contains a significant amount of aquatic habitat with high potential fish habitat, and is an important area for fish species when evaluated within the broader context of the Columbia River basin (USFS 1999). The basin currently provides habitat for Endangered Species Act listed species (fall chinook, steelhead, bull trout) and Idaho Endangered or Sensitive Species (Pacific lamprey, redband trout, spring chinook, westslope cutthroat trout). The resident species in the system are thought to be of wild origin, and the system supports both resident and fluvial life histories of westlope cutthroat trout and bull trout. All species remain widely distributed, although the abundance has declined significantly from historic levels (USFS 1999).

Habitat for spawning, feeding, resting, brood rearing, and escape must be provided by the riverine system. Significant areas still exist where uplands, riparian areas and stream conditions are relatively intact. For instance upper Johns and Tenmile Creeks (highlands of the Hump) have had little mining influence and are probably the best habitat for many salmonid species (IDEQ et al. 2002). There is also a significant amount of habitat with high potential to support fish within the Nez Perce National Forest (USFS 1997). Flushing flows maintain the stability and effective function of stream channels (Rosgen et al. 1986), and are a critical requirement to long-term sustainability of healthy riverine systems in the South Fork Clearwater River basin. Adequate flows are required to provide these high quality instream habitats. Therefore, protection of remaining habitat critical to rare plants and animals that rely on these ecosystems for at least some portion of their life cycle is needed.

Outstanding recreational and aesthetic characteristics were also identified in the South Fork Clearwater River basin through the IWRB’s planning process, including recommendations of the citizen advisory group. Though the minimum flows proposed for the basin are targeted for aquatic habitat, the flows would also maintain the outstanding recreational and aesthetic attributes including fishing, boating, driving on a state scenic byway and experiencing the natural setting of the area.

Like any other water right, a minimum stream flow must take its place by priority. Existing water rights will not be harmed by the proposed minimum instream flows. Furthermore, the sites for the instream flow claims are surrounded by public land.

2.3 Water Supply

The term “water supply” refers to the amount of water in a particular area, in this case, the South Fork Clearwater River basin. It is measured as basin yield or precipitation.

2.3.1 Surface Water

Daily stream flow records are available for two locations in the basin, Elk City and Stites (Ondrechen 2002). The greatest discharge as measured at Stites, the farthest downstream gage for the South Fork Clearwater River, was in 1976 (Fig. 4). Average annual volume for the years

1965 to 2002 is 739,000 AFA with a mean annual flow of 1,021 cfs (see Table2).

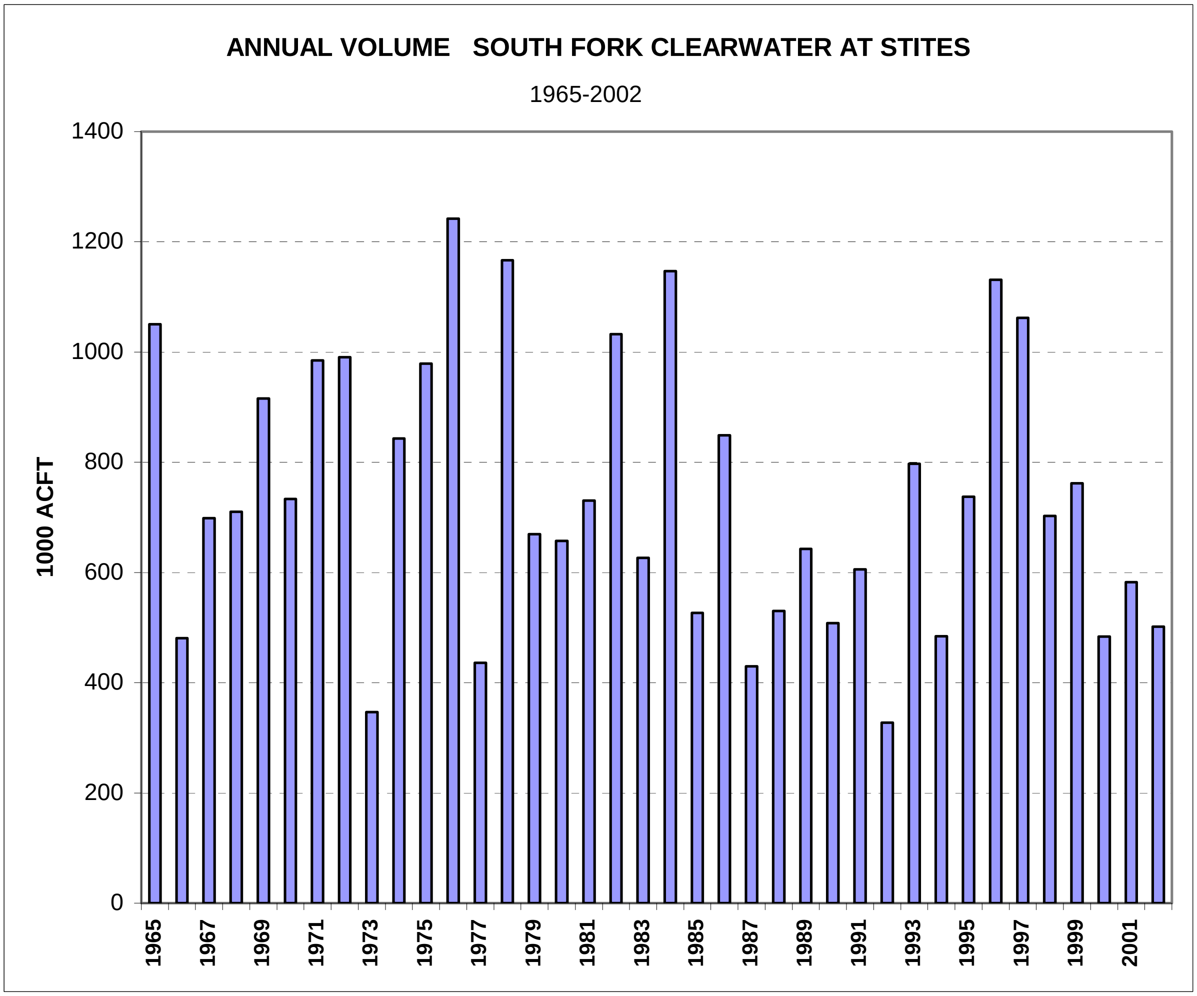


Figure 4. Annual volume - South Fork Clearwater River at Stites.

Table2. Drainage area and average annual runoff .

Location[1]	Drainage Area (mi^2)	Mean Annual Flow (cfs)[2]
Stites	1,150	1,021

[1]Measured at the Stites gage.
[2]Cubic feet per second, observed average annual runoff for period 1965-2002.

IDWR designates standard irrigation seasons of use for the different areas of the state. The standards are based on the water requirements of alfalfa, and take into account climate and elevation (Peppersack 1999). For most of the lower elevations in the South Fork Clearwater River basin, the irrigation season is from March 15 to November 15.Upper elevation farmlands on Camas Prairie have a season from April 1 to October 31.

Recent Historic Floods and Flood Impacts

Currently, river flows are measured and recorded for the South Fork Clearwater River at the U. S. Geological Survey (USGS) gages at Stites (#13338500) and near Elk City (#13337500). The Elk City gage is located 4.5 miles west of Elk City and has a period of record from September 1944 to September 1974, and from August 2002 to the present. The Stites gage is located at Stites, and has a period of record from October, 1910 to April, 1912, and from October, 1964 to the present. In addition, another gage (#13338000), was located about 8 miles upstream of Harpster, and was referred to as "South Fork Clearwater River near Grangeville." This gage had a period of record from May, 1911 to May, 1920, and from May, 1923 to June, 1963 and is no longer in service.

Flood stage at the Stites gage is considered to be 8.0 feet (gage height) with a flow of 9,570 cfs. Since 1948, the river has been at flood stage nine times. Recorded flood stages since 1948 are shown in Table3.

Table 3. Recorded flood stages at Stites.

Date	Gage Height (feet)-River Stage	Peak Flow (cubic feet per second)
May 29, 1948	10.1	16,800
May 20, 1957	8.70	11,800
June 8, 1964	10.3	17,500
May 16, 1975	8.30	9,890
May 11, 1976	8.25	9,710
May 8, 1979	8.01	9,870
May 6, 1995	8.56	11,100
February 7, 1996	8.82	12,100
January 1, 1997	8.68	11,600

Table 4 shows the flood frequency estimates at Stites from the Federal Emergency Management Agency (FEMA) Flood Insurance Study for Idaho County. A 100-year flood event has a recurrence interval of 100 years, or a 1% probability of occurring in a given year. Fig. 5 shows the average monthly flows at Stites for the period of record for that gage.

Table 4. Flood frequency estimate at Stites.

Recurrence Interval (years)	10	50	100	500
Peak Discharges (cubic feet per second)	11,300	15,600	17,400	21,700

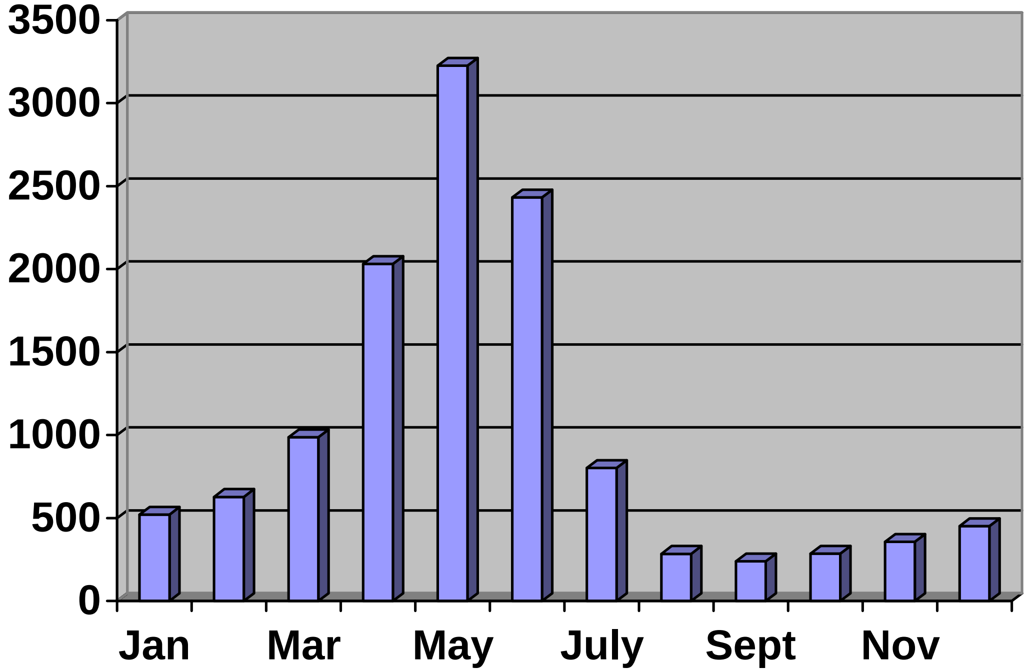


Fig. 5. Average monthly flows at Stites (cubic feet per second).

Flooding along the South Fork Clearwater River and in major tributaries is normally the result of high spring runoff from melting snowpack, warm winter rains and snowmelt, or a combination of both. Winter floods are normally caused by cold Canadian air moving into the watershed followed by wet Pacific weather systems moving over this cold air. Considerable snowfall is followed by rapid warming and heavy rain, which causes significant snowmelt and runoff. Spring floods usually are caused by warm temperatures, heavy rains and a rapid melt of a heavy snowpack.

Two of the largest floods in recent times occurred in May 1948 and June 1964. The 1948 flood was the result of high spring runoff from the melting of a high snowpack. The 1964 flood was caused by 3.5 inches of rainfall in a 50-hour period compounded by high snowmelt runoff. The peak flows at Stites for these floods were 16,800 cfs on May 29, 1948, and 17,500 cfs on June 8, 1964. The recorded peak flows at Kamiah on the Clearwater River were 99,000 cfs, and 103,000 cfs for the same events.

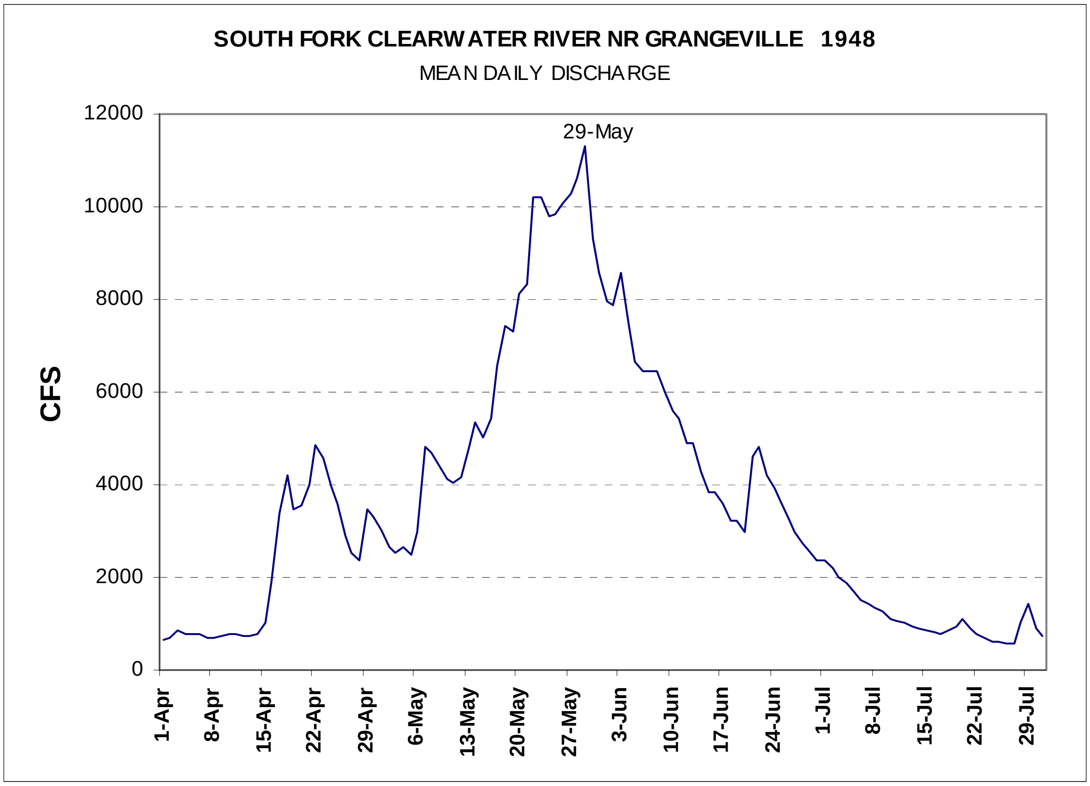


Fig. 6. South Fork Clearwater River near Grangeville –mean daily discharge in 1948.

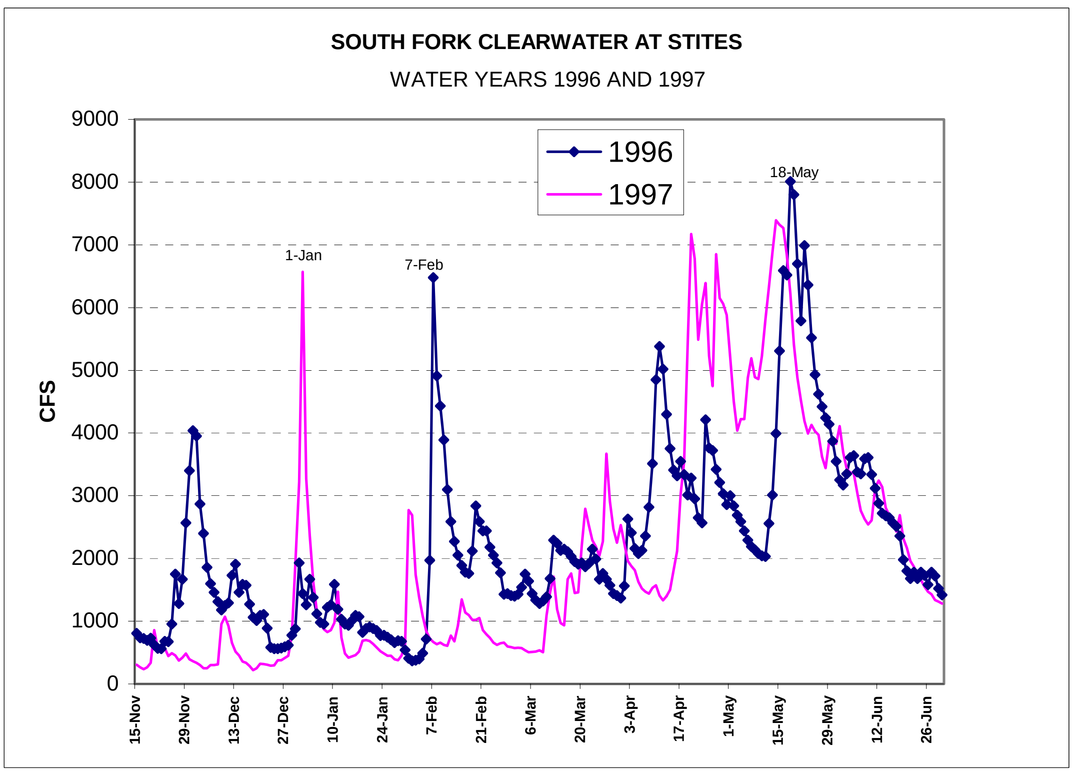


Fig. 7. Hydrographs of the South Fork Clearwater River at Stites for water years 1996 and 1997.

Widespread flooding took place along the South Fork Clearwater River and major tributaries in the 1948 and 1964 events. Heavy damage was caused by the floodwaters and large accumulations of debris, especially logs. A logjam nearly three miles long was observed on the Clearwater River, which contributed to heavy damage of the railroad bridge, and closing of the highway bridge at Kamiah. Extensive damage took place in the communities of Kooskia, Stites, and Harpster. As a result of the 1948 flood, and another one in February 1949 caused by rain and ice jams, the U. S. Army Corps of Engineers (USACE) constructed emergency flood control levees at Kamiah, Kooskia and Stites. These levees were constructed under emergency conditions and do not provide 100-year (17,400 cfs) protection. Past floods have destroyed portions of the levees, and only some have been rebuilt. A hydrograph of the mean daily discharge for the old South Fork Clearwater River gage "near Grangeville," 8 miles upstream of Harpster, is shown for the 1948 flood event (Fig. 4).

Flood events in 1996 and 1997 were similar in that a winter flood was followed by a spring flood. Cold Canadian air moved into the basin followed by wet Pacific storm systems moving over the cold air, causing heavy snow followed by heavy rain. The winter floods were caused by warm temperatures and heavy rain melting the mid and low elevation snowpack. Warm temperatures and heavy rain melting the higher elevation snowpack caused the spring floods. Flooding was widespread throughout the lower South Fork Clearwater River, but not as extensive as the 1948 and 1964 floods. Stites Creek overflowed its banks and flooded the highway. Highway damages for the 1997 floods were $2,5 million in Idaho County. Additional flood damage claims for Idaho County were $282,000 for the 1996 event and $698,000 for the 1997 event, with most of the damage in the Little Salmon River basin. The hydrographs for these flood events are shown in Fig. 7.

2.3.2 Ground Water

Aquifers are found where streams deposited sand and gravel, and where fractures are formed in rock. Geologists can understand aquifers and ground water flow patterns by mapping rock outcroppings and reviewing well logs. Development of ground water in the basin has been almost exclusively for domestic and municipal uses (Bendixsen 2000).

Castelin (1976) did the first work on ground water supply and availability in the Camas Prairie area. Ralston et al. (1993) addressed the issue of ground water supply on the Camas Prairie in the Grangeville area in the 1990's. Data from water wells drilled in the Grangeville area provided the information for the analysis of the ground water flow. The primary aquifers in the area are at the contact points between individual basalt flows. Basalt flows in the area are generally parallel but the continuity is broken in some places by faults. The intricate geology of the area creates a unique environment for the complex movement of ground water (Castelin 1976).

Ralston et al. (1993) found ground water declines in and around the City of Grangeville that ranged up to 21 feet per year. Ground water declined in the area faster than in other parts of Idaho. Much of the decline was attributed to poor well construction and penetration of multiple aquifers with deep wells. Many of the deep wells were constructed without casings, likely allowing water from the shallow aquifers to drain to lower zones (Ralston et al. 1993). Ralston recommended reconstructing several deep wells in the area to monitor the ground water decline.

2.3.3 Water Quality

Surface Water Quality

The Idaho Department of Environmental Quality (IDEQ) is the agency primarily responsible for water quality in Idaho's rivers and lakes. As a requirement of the Clean Water Act, IDEQ must provide an accurate assessment of the state's waters. The IDEQ works to implement federal and state water quality standards, including the regulation of pollutants that are discharged to the state's waters (http://www.deq.state.id.us/water/surface_water/WaterQualityStandards.htm). IDWR has water quality responsibilities as they relate to water quantity. IDWR coordinates with IDEQ on water quality concerns and protection efforts in the development of comprehensive state water plans for individual basins.

Water quality affects the quantity available for some uses. If water quality is compromised, it may not be suitable for some uses. Refer to the water quality section in the Basin Description for more information.

Implications

Restoration or maintenance of high quality aquatic habitat is a necessary component to restore high quality fisheries to the South Fork Clearwater River. While water quality is very important to fish management, fish species also require diverse habitats that meet the needs of all life stages in order to maintain healthy, reproductive populations. Factors outside the basin (e.g., dams) also have a significant impact on fish populations and abundance within the basin. The Northwest Power and Conservation Council (NWPCC) is coordinating efforts within the Columbia basin to address the numerous factors affecting anadromous and resident fish impacted by energy issues. (Subbasin Assessment http://www.nwppc.org/library/releases/2002/1113.htm and Subbasin Plan http://www.nwppc.org/library/isrp/isrp2003-3.htm)

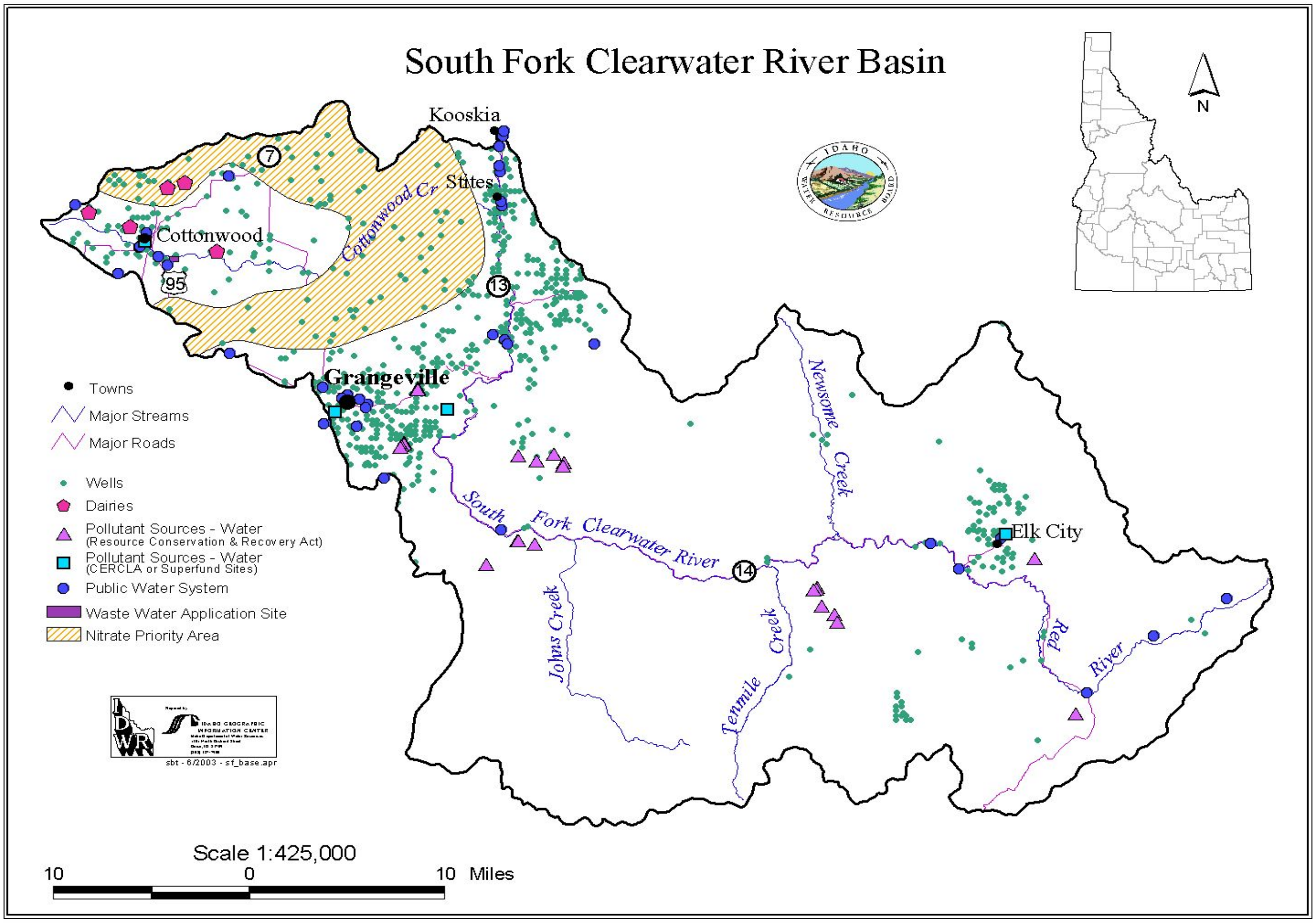
Ground Water Quality

The need for ground water protection is essential in Idaho, where 90% or more of the population gets its drinking water from ground water sources (Clark 1998). The Ground Water Quality Protection Act of 1989 provided the framework for cooperative efforts between IDEQ, IDWR, ISDA, and other entities in comprehensive ground water quality assessment and protection activities (GWQC 1996). Prevention measures and programs are emphasized in the Ground Water Quality Plan as the most efficient and cost-effective means to protect the valuable ground water resources of the state.

IDEQ is designated as the primary agency to coordinate and administer ground water quality protection programs for the state (Idaho Code § 39-120) through permitting, monitoring, grants and loans, and technical assistance programs. Specific programs include Source Water Assessment, Drinking Water Program, Stormwater Program, and the Waste and Wastewater Program. IDWR and the Idaho Department of Agriculture (ISDA) work cooperatively with IDEQ on ground water protection and monitoring efforts. Additionally, many local, state, and federal programs deal with specific aspects of ground water quality (such as prevention, education, and monitoring), and work cooperatively with IDEQ to protect and restore the resource.

Protection of Public Drinking Water

Because of the large percentage of the basin's population that relies on ground water as their source for drinking water, source water assessment is an essential element in ground water quality



protection activities. In addition to IDEQ's Drinking Water Program, the Source Water Assessment Plan for Idaho (IDEQ 1999) provides coordination of effort and collaboration among the many source water protection activities that are largely the responsibility of local jurisdictions. IDEQ is in the process of completing source water assessments for all public water systems, which includes delineation of the area that may contribute to source water contamination, contamination source inventory, susceptibility analysis, and public distribution of findings (scheduled for completion in 2005). Source water extraction points in the South Fork Clearwater River basin are shown on Map 2. Many other federal and state programs can integrate and contribute to source water protection. The plan also encourages the use of programs such as well-head protection to ensure the safety of domestic well water. The program emphasizes the need for a combination of BMPs to be most effective. These include land use controls, regulations and permits, structural measures, well-head protection, public education, land management, and emergency response preparedness plans (EPA 2001).